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back upon itself. Phenomena perfectly analogous to those observed in frogs, may be produced in warm-blooded animals, by the action of inverse currents; they continue, however, for a much shorter time, especially if the vitality of the animal is very great. These phenomena clearly belong to the nerve, and have their origin in the relation, the nature of which is yet undetermined, which exists between nervous influence and the action of the electric current according to the direction of that current. Thus a limb traversed by the direct current may be compared to a limb fatigued by repeated efforts; the inverse current may be supposed to act in an opposite manner, and during its passage, the nervous force may accumulate in the nerve. The facts here recorded may establish a fresh connection between nervous influence and the passage of the electric current according to its direction.

The sixth series treats of the laws of the electric discharge of the Torpedo and other electrical fishes, and of the theory of the production of electricity in these animals. Irritations applied to any point of the body of an electrical fish are transmitted by the nerves to the fourth lobe of the brain, and are then followed by the electric discharge: the nervous action by which this discharge is determined under the influence of the will resides in that fourth, or *electrical lobe* of the brain; for after the three superior cerebral lobes have been removed, the torpedo can still give the shock, either voluntarily, or by external irritations. The separation of the two electricities which takes place in the cells of the electrical organ, under nervous influence, are instantaneously reunited by the discharge. The strength of the current obtained during the discharge is proportional to the length of the cellular prisms included in the closed circuit. The author concludes that the nervous force increases independently of the will with every increase in the activity of the functions of circulation and of respiration, and of every act of nutrition, and also under the influence of certain agents introduced into the system.

The seventh and last series treats of the relation that exists between the intensity of the electric current and that of the corresponding physiological effect. A detailed account is given of the apparatus employed, and of the method of experimenting, which the author had recourse to in his researches on this branch of the subject. The amount of the contractions produced in muscles under different circumstances of electric excitation is stated in a table which closes the paper.

2. "On different properties of Solar Radiation, producing or preventing a deposit of Mercury on Silver Plates coated with Iodine, or its compounds with Bromine or Chlorine, modified by coloured glass media and the vapours of the atmosphere." By A. C. Claudet. Communicated by Sir David Brewster, K.H., D.C.L., F.R.S., &c.

At an early period of the study of photography, it was observed that the red, orange and yellow rays are endowed with antagonistic powers, preventing and destroying the action produced by white

light, or by the rays properly called *photogenic rays*. One of the first discoverers of this property was Dr. Draper of New York: his experiments were made with the pure rays of the spectrum acting on the Daguerreotype plate. Previously to this, however, Sir J. Herschel had made similar observations on the action of the pure rays of the spectrum on several kinds of photogenic paper. Dr. Draper also found that the red, orange and yellow rays which protect the plate from ordinary photogenic action, are themselves capable, when isolated, of producing a peculiar photogenic effect. In opposition to the hypothesis of an antagonistic or destroying action exercised by the red, orange and yellow rays, M. E. Becquerel announced that those rays are endowed with the property of continuing the action commenced by the photogenic rays.

The author of the present paper has made a series of observations on light transmitted through certain colouring media, through the vapours of the atmosphere, and through red, orange and yellow glasses. Having directed a camera obscura to the sun when his disc appeared through a fog quite red, he obtained, after ten seconds, a black image of the sun. The red sun had produced no photogenic effect, although the surrounding spaces had been sufficiently affected by the photogenic rays coming from the zenith to attract the white vapour of mercury; thus proving that the red rays have no photogenic power. In another experiment he left the plate in the camera during twenty minutes. The sun had passed over a long space on the surface of the plate, and the result was a long image of the sun, quite black throughout; so that not only the red sun had produced no photogenic action, but the red rays had destroyed the effect produced previous to their passage. Not content with the result obtained by the slow motion of the sun, he next moved the camera obscura from right to left, and *vice versa*, lowering it each time by means of a screw. In this manner the sun was made to pass rapidly over five or six zones of the plates, and its passage was marked by long black bands, while the intervals were white; showing again that in order to destroy the action of the photogenic rays, it was sufficient to cause the red rays to pass rapidly over the spaces previously affected by the former.

He afterwards operated with coloured glasses. After having taken the impression of a piece of black lace by white light on a Daguerreotype plate, he covered one half of the plate and exposed the other to the radiation of a red glass. The mercury developed an image of the lace on the part which had been acted on only by the white light; and the other part, which had afterwards received the action of the red rays, remained black. The red glass had destroyed the photogenic effect, precisely as was the case with the red light of the sun. He made similar experiments with orange and yellow glass, and obtained analogous results, but in different periods of time. These experiments prove that the red, orange and yellow rays destroy the effect of photogenic light, whether these rays are produced by the prism or by the action of coloured media; but the author believes that he was the first to remark, that after the de-

struction of the photogenic effect, the plate is perfectly restored to its former sensitiveness to white light.

After exposing a plate to the daylight, and then submitting it to the destructive action of red, orange or yellow rays, it will be found to be again sensitive to the same white light. It appears from the author's observations, that a plate may be exposed to these two actions alternately, for any number of times, without altering the final property of the surface, which will be invariably sensitive to the vapours of mercury, if its last exposure has been to the action of white light; whilst it will be deprived of that sensitiveness if it has been exposed lastly to the action of the red, orange or yellow rays. It results from the restoring action of the red, orange and yellow rays, that Daguerreotype plates may be prepared in open daylight; and that in order to give sensitiveness, it is necessary only to place the plate for some minutes under red glass before putting it into the camera obscura. The knowledge of this will be advantageous to persons wishing to take views in places where it is difficult to find dark rooms in which to prepare the plates.

Besides the destructive actions of the red, orange and yellow glasses, these same radiations are endowed with a photogenic action of their own; that is to say, they have, like the blue and violet rays, the power of causing the fixation of mercurial vapours. Those radiations, therefore, are endowed with two actions of a contrary nature; one destructive of the effect of the photogenic light, and the other producing an effect analogous to that light.

The photogenic action of the red rays is 5000 times, that of the orange 500 times, and that of the yellow 100 times slower than white light in producing an equal amount of effect. The destructive action of the red rays is 100 times slower than that of the white light, the orange 50 times, and the yellow only 10 times. When a plate has been exposed to the destructive action of any particular ray, it cannot be affected photogenically by the radiation which has destroyed the first effect; it is sensitive only to the other radiations. The photogenic action of any radiation cannot be continued by another.

The solar spectrum is therefore endowed with three different photogenic actions, and three different destroying actions, corresponding with the red, the yellow and the blue rays. The three photogenic actions of the spectrum thus distinguished have distinct characters; each of these radiations is endowed with a photogenic power peculiar to itself, and which gives to the Daguerreotype plate an affinity for mercurial vapours; nevertheless these three actions are so different, that we cannot, by mixing them artificially, make one assist the other; for they are antagonistic. The effect produced by the blue rays is destroyed by the red and yellow; the red and yellow mutually destroy each other, and the effect of either is destroyed by the blue. The alternate changes of the surface of the plate by these three kinds of radiation seem to prove that the chemical compound remains always the same under these different influences, and that there is no separation or disengagement of the constituent elements.

The author has no doubt that electricity, which accompanies each radiation, acts positively under the influence of the one, and negatively under that of the other, without changing the chemical compound; in the one case this influence would give the affinity for mercury, and in the other it would destroy it.

3. "On the Value of Absolute Alcohol in Spirits of different Specific Gravities." By George Fownes, Esq., F.R.S., Professor of Practical Chemistry in University College, London.

Having been recently engaged in a series of experiments on the fermentation of sugar and molasses, which rendered it necessary to refer to a table of the value in absolute alcohol of spirits of different specific gravities, the author found himself compelled to construct for this purpose a new table, which he lays before the Royal Society in the present paper.

The table was formed by weighing out absolute alcohol and distilled water in fixed proportions, mixing them, and after allowing time for condensation, determining with suitable precautions the specific gravity of each mixture at the temperature of 60° Fahrenheit. Each alternate number in the table was so obtained; the rest being interpolated. The alcohol employed was prepared by digesting the strongest rectified spirit, first with dry carbonate of potash and afterwards with powdered quicklime and distilling. It had the specific gravity .7938 at 60°, and boiled at 177° Fahr.

The table is followed by a diagram for the purpose of contrasting the actual specific gravities found by experiment with the calculated mean specific gravities of the various mixtures of alcohol and water, in which the specific gravities are indicated by horizontal lines and the proportions of the two liquids by vertical lines. The mean specific gravities of course run straight across the diagram from corner to corner, while the actual specific gravities form an irregular curve with upward convexity, rising rapidly to near its maximum deviation at 30 per cent., proceeding nearly parallel with the other line to 50 per cent., and thence declining until it reaches the extremity of the scale.

4. "On the existence of alternating diurnal Currents of Electricity at the Terrestrial Surface, &c., and their connection with the Diurnal Variation of the Horizontal Magnetic Needle." By W. H. Barlow, Esq., M.I.C.E. Communicated by Peter Barlow, Esq., F.R.S., &c.

The observations recorded in this paper were undertaken in consequence of certain spontaneous deflections having been noticed in the needles of the Electric Telegraph on the Midland Railway. The telegraph is constructed on the principle patented by Messrs. Wheatstone and Cooke, and the signals are made by deflecting a magnetic needle placed in a coil, to the right or left, by means of a galvanic battery. It was observed that when no signals were passing, and when the wires of the telegraph had simply connexion with the earth at the two termini, spontaneous deflections, differing